

DISCUSSION OF THE AMENDMENTS

Claims 20 and 37 are amended.

Claim 21 is canceled.

Claims 1-19, 22-23, 25-34, 36, 38-49 and 52 were previously canceled.

Claim 37 has been to recite that the inclusion of the nanoparticles in the dielectric film, and claim 20 has been amended for antecedent basis.

Support for the amendments to claims 20 and 37 can be found throughout the specification and in claim 21, as originally filed.

No new matter has been added by the amendments.

Upon entry of the amendment, claims 20, 24, 35, 37, 50, and 51 will be pending in the present application.

REMARKS

The claimed invention relates to a dielectric film with relative dielectric constant greater than 10 comprising:

nanoparticles having a diameter size in the range between 2 nm and about 20 nm; and
a crystalline structure having a relatively narrow grain-sized distribution,

wherein said narrow grain-sized distribution has a standard deviation selected from the group consisting of: less than 15%, less than 10% and less than 5%.

Applicants have found that the narrow grain-sized distribution of the nanoparticles overcomes the obstacles of conventionally manufactured dielectric films used in devices, such as capacitors, field effect transistors, and various memory devices. For instance, the narrow grain-sized distribution prevents the formation of voids between grains, which can cause electrical shorts in such devices. Such a dielectric film, having the narrow grain-sized distribution of the claimed invention, is not described or suggested by the references of record.

Reconsideration of the claimed invention is requested, in view of the above reasons and those further discussed below.

The rejection of claim 37 under 35 U.S.C. § 102(b) as anticipated by Li et al. (US 2002/022278) is respectfully traversed and obviated by amendment.

Li et al. generally describes a ferroelectric film having a polycrystalline structure and uniform particles. In particular, according to the reference, the “deviation in uniformity of the grain size is less than approximately 10%.” (Para. [0042] of the reference). However, as described throughout the disclosure of the reference, the particle size is 0.2 to 0.8 microns, preferably 0.3 micron (i.e., 300 nm). (See *id.* at para. [0042] and [0051] of the reference).

By contrast, as presently claimed, the nanoparticles have a diameter size in the range between 2 nm and about 20 nm, which is well below the particle size described in the reference. Therefore, the reference clearly does not describe the claimed invention. Moreover, there is no suggestion that one would be motivated to modify the disclosed micron-sized particles to the claimed nanoparticles, nor any evidence of narrowing the distribution of such particles to a standard deviation of less than 15%.

Therefore, the claimed invention is novel and unobvious over the cited reference. Accordingly, withdrawal of the rejection is requested.

The rejection of claims 37, 20, 24, 35, and 50 under 35 U.S.C. § 102(b) as anticipated by Hartman et al. (US 2001/0036052) is respectfully traversed.

Hartman et al. generally describes a dielectric layer that may include filler of various nanoparticles. In particular, the reference indicates that the particles are combined (distributed) in a polymer or resin system, and then applied on a layer or substrate. (See, e.g., para. [0024] through [0026] of the reference). However, there is no requirement that the layer have the claimed crystalline structure. Moreover, there is no evidence or suggestion that the distribution of the particles in the polymer or resin system results in a narrow grain-sized distribution having a standard deviation of less than 15%, as presently claimed.

Therefore, the claimed invention is novel and unobvious over the cited reference. Accordingly, withdrawal of the rejection is requested.

The rejection of claims 37, 20, and 51 50 under 35 U.S.C. § 102(b) as anticipated by Constantino et al. (US 2001/0048969) is respectfully traversed.

Constantino et al. generally describes barium titanate-based particles coated with a metal oxide and having particle sizes less than 0.9 micrometer. In particular, the barium titanate-based particles must include a coating of “an oxide, hydrous oxide, hydroxide oxide or organic acid salt of at least one metal other than barium and titanium.” (Para. [0029] of the reference). (Emphasis added).

By contrast, there is no such metal oxide coating on the claimed nanoparticles, which are composed of and defined by the dielectric materials described in the present specification. (See present specification at page 8, lines 6-29). Moreover, it is noted that in the formation of the claimed nanoparticles, an organic layer may be applied. (See *id.* at page 9, lines 1-20). However, the layer is removed after sintering and formation of the film. (See *id.* at page 10, lines 25-29). On the other hand, in Constantino et al., there is no evidence or suggestion that the disclosed metal oxide layer is removed whatsoever from the particles. As such, the disclosed particles remain coated with the layer, which teaches away from the present invention.

Therefore, the claimed invention is novel and unobvious over the cited reference. Accordingly, withdrawal of the rejection is requested.

In view of the foregoing amendment and remarks, Applicant believes the pending application is in condition for allowance.

In the event the Examiner believes an interview might serve to advance the prosecution of this application in any way, the undersigned attorney is available at the telephone number noted below.

Applicant believes no fee is due with this response. However, if a fee is due, please charge our Deposit Account No. 50-0510, under Order No. 20140-00343-US2 from which the undersigned is authorized to draw.

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Respectfully submitted,

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